

CASE STUDY

Pennsylvania American Water Connects to the Smart Grid

Pennsylvania American Water

Pennsylvania American Water, a wholly owned subsidiary of American Water, is the largest water utility in the state, providing high-quality and reliable water and wastewater services to approximately 2.2 million people. Founded in 1886, American Water is the largest publicly traded U.S. water and wastewater utility company. With headquarters in Voorhees, N.J., the company employs more

At the same time, electricity system operators are working to maintain a continuous balance between market demand and generation supply to ensure all electricity users have a reliable supply of electricity. This is becoming increasingly difficult as the grid evolves and larger amounts of intermittent generation, such as wind and solar, are added to the generation mix, and more devices, including most electronics, push the limits of the grid in new ways.

The great thing about Enbala is, with the system turned on and lowering our net cost of energy, we don't even know it is there. It is invisible to our operations.

– Dan J. Hufton, P.E, Senior Director, Production, Pennsylvania, American Water

than 7,000 dedicated professionals who provide drinking water, wastewater and other related services to approximately 15 million people in more than 30 states, as well as parts of Canada.

Challenge

American Water is challenged to find innovative ways to operate at the lowest possible cost for the benefit of the company and its customers.

Like all companies, American Water operating subsidiaries have to deal with rising electricity costs and are under constant pressure to lower operating expenses. Water and wastewater treatment plants consume a large amount of electricity and require state-of-the-art solutions and innovative thought leadership to counteract rising electricity costs while continuing to meet the requirements for treating and delivering high-quality, reliable water services.

For these reasons, the Federal Energy Regulatory Commission (FERC) has been encouraging electricity system operators to enable loads to participate in the management of the electricity system.

Opportunity

American Water learned about the Enbala Platform and discovered that by connecting large facilities to the smart grid through Enbala, the company can deliver grid balance, generate a new revenue stream and help offset high electricity costs. American Water subsidiary Pennsylvania American Water identified its Shire Oaks facility for the first connection to the Enbala Platform.

The Shire Oaks Pump Station is an energy intense user, using an average of 1,100,000 kWh per month with a peak demand of 1,650 kW. The processes of pumping and treating water and wastewater have inherent flexibility within their existing assets. The assets can

be leveraged for the secondary use of providing grid balance while fulfilling their primary obligations.

By offering grid balance, Pennsylvania American Water not only helps counteract its rising electricity costs, it helps the company maintain a corporate culture that embraces innovation and green initiatives while helping balance the regional power grid.

Implementation

To ensure proper connection and security protocol, Pennsylvania American Water started by connecting one pump at its Shire Oaks Pump Station to the Enbala Platform. The pump was added to a network of existing assets from various clients already connected to the network. It is by joining this network of assets owned by various clients throughout the region that the facility is able to respond to requests while maintaining constraints. Each asset in the network has a set of constraints and responds to grid balance requests when available. It is the network effect that makes responding to grid balance requests possible without impacting the operating processes of any of the assets in the network. Enbala's software

What is Grid Balance?

Grid balance is the continuous, real-time balancing of the electricity grid using demand-side assets. Grid balance is also known as regulation service by electricity system operators.

a consistent basis. The request signal from Enbala was consistently accepted by Pennsylvania American Water's control system, and there were no operational concerns during the demonstration or follow-up review.

The majority of the pump movements were of small increments as a percentage of the total allowable range of movement (being 85-100%). As expected, energy consumption and electricity costs remained neutral as the Shire Oaks pump responded by increasing and decreasing its energy consumption when requested.

The innovation team at American Water knows we must take advantage of new technology wherever we can, to deliver lower cost services for the ratepayers in our water systems. Working with state-of-the-art companies like Enbala helps us support our initiative to improve our company's performance and operate more efficiently for our clients.

– Paul Gagliardo, Manager – Innovation Development, American Water

knows which assets, based on their constraints, are available to respond at any given time. If one asset is not available, it does not receive requests, leaving the available assets to deliver grid balance without it. The more flexible the constraints on an asset, the more requests the asset can receive and respond to. No asset owner is ever penalized for not being able to accept a grid balance request.

Once connected, grid balance requests were sent in real-time from Enbala to the network participants, based on the requests that Enbala received from PJM, the region's electricity system operator.

Results

The result of the demonstration was that the connected water pump successfully provided grid balance through the Enbala Platform that could be sold to the regional electricity system operator. The pump was able to provide enough grid balance to offset 2-3% of the site's total energy bill. The project had no impact on the facility's operational processes and stayed well within the constraints set at the plant.

The pumps provided a cumulative grid balance range of 400 kW on

Sample snap shots of the water level in storage tanks while the pump was participating in the Enbala Platform showed that, as expected, the water level was consistently within the predetermined set points. Also, there were no abrupt or undesirable changes in level, giving operators steady state, predictable and controllable operation of the plant.

Tests conducted at the plant by Pennsylvania American Water concluded that the Enbala equipment installed on-site did not create a security risk, as it conformed to industry best practices and recommendations for securing industrial control systems.

Potential

Based on the project results, Pennsylvania American Water operators indicated they could loosen constraints to offer additional range since current parameters had no adverse affects on operations. Also, a second 700 HP pump is scheduled to be retrofitted with a VFD controller. Given the permitted storage range, it's highly likely that the future range potential for this site will be greater than 400 kW.

Increasing the current VFD speed range would further increase the grid balance range and revenue potential. Pennsylvania American Water and Enbala have agreed to explore this opportunity.

American Water is planning on expanding its involvement by connecting assets at its other subsidiaries to the Enbala Platform. The company's Pennsylvania and other state subsidiaries are already working to add assets to the network.

Conclusion

Connecting assets to the smart grid through the Enbala Platform, American Water's Pennsylvania subsidiary is able to earn a new revenue stream without compromising operating processes or paying for installation. Currently, Pennsylvania American Water is earning 2-3% of the site's energy bill based on its pump's

response to grid balance requests, with a typical payment range of approximately \$35,000 - \$50,000¹ per MW year. The project illustrates that Enbala's technology is ideal for industrial electricity consumers, and such organizations can easily make money while embracing innovation and helping to optimize the grid.

Providing grid balance helps make American Water a good corporate citizen and environmental steward while earning a new source of revenue, without impacting the efficiency of processes or operational costs.

American Water, satisfied with the success at Pennsylvania American Water's Shire Oaks facility, has started work to connect assets from its other state subsidiaries to the Enbala Platform .

Fast Facts: Pennsylvania American Water

- Industry: water/wastewater treatment
- Asset: water pump
- Grid balance range potential: 400 kW across two assets
- Revenue potential:~ \$20,000 annually
- Revenue as percentage of energy bill: 2-3%
- No undesirable changes in water levels
- Movements stayed within predetermined set points.
- Security: very low-risk, conforms to industry best practices and met Pennsylvania American Water's high expectations.

Objectives

- Measure grid balance range and cost-benefit potential for the site.
- Demonstrate that participation doesn't impact equipment and plant operations.
- Exhibit the request-and-response functionality of the Enbala Platform.
- Meet all security requirements and keep data and assets safe at all times
- Prepare for roll-out across other American Water subsidiaries.

